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Quiz 9 Solutions

MAC 1147.3079, Fall 2015

Thursday, November 19, 2015

Show all relevant work to support your answer. A correct answer without supporting work will not earn the points. **Problems 3 and 4 are on the back.**

1. (1 point) What's your favorite quote (i.e from a movie, book, etc.)? (Hint: There is no wrong answer)

> **Solution:** Answers vary, but the most acceptable is:
> "The first rule of Fight Club is: you do not talk about Fight Club."

2. (4 points) Evaluate the inverse trigonometric expressions:

   (a) $\arcsin(\frac{1}{2})$

> **Solution:** The above statement translates to finding θ in the statement $\sin\theta = \frac{1}{2}$. This occurs when $\theta = \frac{\pi}{6}$ or 30°.
>
> Note, we used the fact that the range of $\arcsin x$ is $[\frac{-\pi}{2}, \frac{\pi}{2}]$, which is the domain of the restricted sine function. This is why we specifically chose $\frac{\pi}{6}$ as the solution.

   (b) $\sin(\arctan x)$

> **Solution:** If we let $\arctan x = \theta$, then $\tan\theta = x$ (after taking tan of both sides). Hence we get the following diagram:
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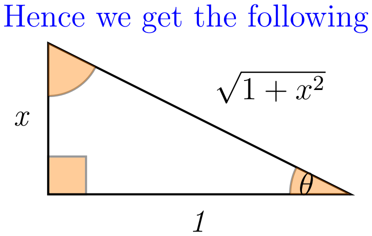
> 
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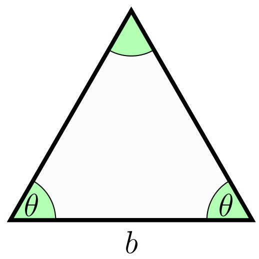
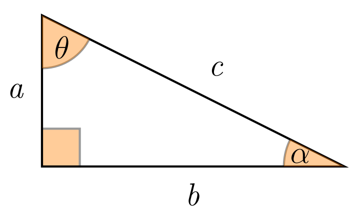
> Now since we let $\arctan x = \theta$, our problem translates to finding $\sin\theta$ using our triangle. Hence, $\sin\theta = \dfrac{x}{\sqrt{1+x^2}}$

3. (2 points) Find the altitude of the triangle shown below given that $\theta = 18°$ and $b = 10$.



Solution: First, draw a line from the top of the triangle to the midpoint of the base of the triangle. The length of this segment, denote by a, is the altitude. In short, we have divided the triangle into two right triangles. The measure of the base of each right triangle will be $10/2 = 5$. Thus, using the identity $\tan(18°) = \frac{a}{5}$, we see $a = 5\tan(18°)$.

4. (3 points) Given $\alpha = 30°$ and $b = 3$, find the remaining sides and angles.



Solution: First, since $\alpha = 30°$ and we are looking at a right triangle, then $\alpha + 30° + 90° = 180°$, and so $\alpha = 60°$.

Next, we use trig identities to find the missing sides. Hence $\tan(30°) = \frac{a}{3}$, or $\frac{\sqrt{3}}{3} = \frac{a}{3}$. So we see $a = \sqrt{3}$. Lastly, use the identity $\cos(30°) = \frac{3}{c}$, or $\frac{\sqrt{3}}{2} = \frac{3}{c}$. Then $c = 2\sqrt{3}$.